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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/779,749	02/18/2004	Yoshihiro Kimura	H6808.0040/P040	2045

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EXAMINER	
JOHNSTON, PHILLIP A	

ART UNIT	PAPER NUMBER
2881	

MAIL DATE	DELIVERY MODE
08/24/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/779,749	KIMURA ET AL.	
	Examiner	Art Unit	
	Phillip A. Johnston	2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 May 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Detailed Action

1. This Office Action is submitted in response to the amendment filed 5-25-2007, wherein claims 1,2, and 10 have been amended. Claims 1-11 are pending.

Response to Arguments

2. Applicant's arguments filed 5-25-2007 have been fully considered but they are not persuasive.

3. Applicant argues at pages 10 and 11 of the remarks that, the present claims have a feature that does not exist in the Archie; that is, the present invention compares a first distance on the convex side of one peak of a pattern portion of a derivative waveform with a second distance on a concave side thereof. Also, "a position where the derivative waveform converges" on the convex side or "a peak top of a second side of the derivative waveform" on the concave side are not considered.

4. The examiner disagrees. Archie teaches forming the waveform 700 in Figure 7 below by scanning a charged particle beam across a resist line feature located on a semiconductor wafer, and describes the waveform 700 at Col. 6, line 9-33, which states; In SEM trace 700, there are two maxima or top points 702 and 705, which correspond to the vicinity of the two top edges of the line. On either side of each the two top points 702 and 705, there is a steeply sloped region of the waveform. If small, high frequency noise components of the waveform 700 are filtered out or ignored, the magnitude of the

slope is greatest in the regions on either side of the two top points 702 and 705. Points 701 and 706 in waveform 700 correspond to the vicinity of the bottom corners where the feature meets the substrate.

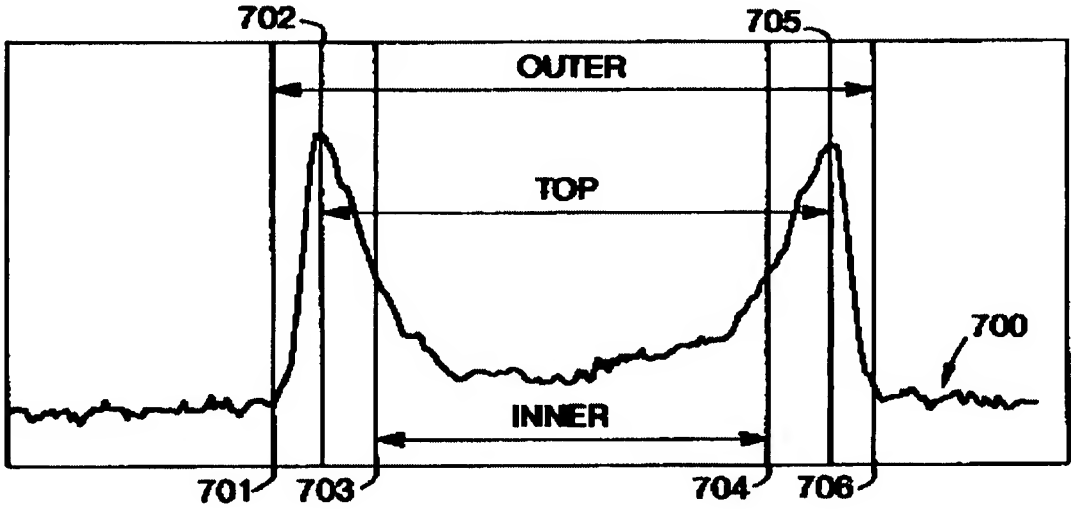

FIG. 7

The remaining two points 703 and 704 (referred to herein as "inner points") are the points where the absolute value of the slope of the waveform begins to decrease from the maximum value near the top points 702 and 705. One of ordinary skill recognizes that these points may be determined by computing the derivative of the waveform 700, to determine the slope, and selecting the points at which the difference between the slope and the maximum slope reaches a threshold value. Thus, although the word "slope" is used extensively herein, it is understood that either a numerically calculated slope or an analog waveform corresponding to the time derivative of the SEM waveform provide equivalent information (assuming that low pass filtering is performed on the waveform to eliminate spiked noise components).

The examiner has interpreted from the above that the Archie disclosure teaches use of the magnitude of the slope of the waveform to define the shape of resist line features in terms of points on the waveform where the slope increases, reaches a maximum, or decreases. For example, Archie shows in Figure 7 above that, the slope of the waveform changes most rapidly on the outer portions of the waveform peaks (the left side of point 702 and the right side of point 705 above), as compared to the inner region where the slope decreases more slowly (the inner portions 703 and 704). Archie also teaches that the point on the outer portions where the slope changes rapidly from its maximum (converges) identifies the point where the edges of the line meet the substrate or baseline, and that the less rapidly decreasing slope on the inner portions of the waveform identifies the top of the line feature. Archie also teaches that computing the derivative of the waveform is an equivalent means for determining the rate of change of the slope of the waveform.

Thus the examiner has determined from the Figure 7 discussion above that, Archie discloses the use of a derivative waveform to define the position where the waveform converges on the outer regions as the location where the edges meet the substrate, and uses the derivative waveform to define the position where the waveform converges on the inner regions as the location of the top of the resist line. In addition, one of ordinary skill would recognize the location where the edges meet the substrate as a convex region, and the location of the top of the resist line as a convex region equivalent to the corresponding regions 101 (top of resist line) and 102 (edge) identified in applicants Figure 1 below.

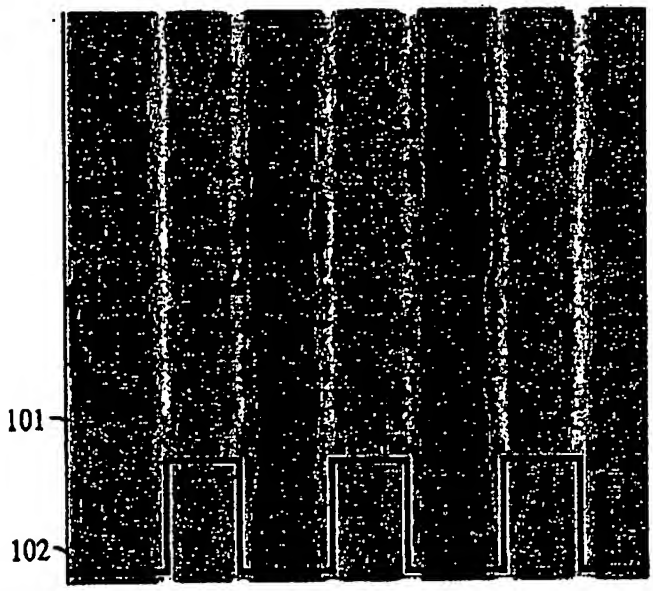

FIG. 1

6. The rejection of claims 1-11 under 35 USC 102(b) by Archie is maintained.

7. All claims stand finally rejected.

Claims Rejection - 35 U.S. C. 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-11 are rejected under 35 U.S.C. 102 (b) as being anticipated by Archie, U. S. Patent No. 5,969,273.

4. Regarding claim 11, Archie teaches the use of an SEM (charged particle source) to perform an e-beam scan (scanning deflector) across a resist line (Col. 5, line 36-47), forming a profile waveform of the detected electron signal (Col. 5, line 36-47) with processor 402 (Col. 5, line 3-5). Archie also teaches comparing the absolute value of the slope (comparison means) in

regions on either side the peak locations of the waveform to determine the "humpwidth" of the resist line (Column 6, line 9-3) relative to the baseline of the waveform. Archie further teaches computing the derivative of the waveform 700, to determine the slope, and selecting the points at which the difference between the slope and the maximum slope (determination means) reaches a threshold value (Col. 6, line 23-28).

5. Regarding claims 1,2,5,6, and 10, Archie teaches all the structural limitations of claims 1,2,5,6, and 10, as pointed out above regarding claim 11.

6. Regarding claims 3 and 4, Archie teaches scanning the beam perpendicular to the sample. Note Figure 6A.

7. Regarding claim 7-9, Archie teaches comparing waveform measurements to base line edge width or "humpwidth" threshold levels, which is a pre-registered model. See Abstract; and Col. 3, line 28-67.

Conclusion

8. The Amendment filed on 5-25-2007 has been considered but is ineffective to overcome the references cited in the Office Action mailed 11-27-2006.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

9. Any inquiry concerning this communication or earlier communications should be directed to Phillip Johnston whose telephone number is (571) 272-2475. The examiner can normally be reached on Monday-Friday from 7:30 am to 4:00 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiners supervisor Robert Kim can be reached at (571) 272-2293. The fax phone number for the organization where the application or proceeding is assigned is 571 273 8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ROBERT KIM
SUPERVISORY PATENT EXAMINER

PJ
August 9, 2007